***Spring, 2019***

*In addition, I also wrote another algorithm with bitset library. I was not sure about its usage, just in case I had shift add algorithm.*

1. **Pseudo Code of shift add algorithm:**

input: string x and string y

char carray\_x = converting string x to char

int array\_x = converting char carray\_x to integer array

char carray\_y = converting string y to char

int array\_y = converting char carray\_y to integer array

function multiplication(array\_x,array\_y, string x’s size, string y’s size)

temp = array\_x \* array\_y

function left shift(temp, temp’s size)

result = function addition(temp, result, max size)

return result

write result to output.txt

output: integer decimal number

1. **Pseudo Code of bitset algorithm:**

function to\_ulong: converts bitset to integer

input: char choice

if(choice = yes)

bitset1 = rand()

bitset2 = rand()

result = bitset1 with to\_ulong function \* bitset2 with to\_ulong function

return result

if(choice = no)

input = string x, string y

bitset1 = converting x to bitset

bitset2 = converting y to bitset

integer dec1 = bitset1 with using to\_ulong function

integer dec2 = bitset2 with using to\_ulong function

result = dec1 \* dec2

return result

write result in integer to file

1. **Comparing of time complexity:**

When Karatsuba’s is O(n²), shift and add algorithm’s is O(n) and bitset algorithm’s is O(nlogn).

